

Progress of Sandia's Environmental Restoration Operations



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Sandia Field Office**

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Project Manager
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October 18, 2016





Overview of Sandia's Environmental Restoration Operations

- Mission – Identify, characterize & remediate sites where hazardous &/or radioactive materials have been released
- Scope: 315 sites
 - Legally - Solid Waste Management Units or Areas of Concern
 - For presentation - Environmental Restoration sites or “ER sites”
- All activities regulated by New Mexico Environment Department (NMED) under the 2004 Compliance Order on Consent (COoC)
- DOE/NNSA and Sandia Corporation are in compliance with: Compliance Order on Consent, Federal and State requirements



Overview of Sandia's Environmental Restoration Operations

- Very successful, completed corrective action at 303 of 315 ER sites
- 12 ER sites remain in corrective action process
- Presentation will review progress in completing corrective action at these 12 ER sites
- Focus on progress made during last 6 months



Remaining 12 ER Sites

- 6 “Soil sites”
- 3 “Active mission” sites with deferred corrective action
- 3 Groundwater Areas of Concern
 - Burn Site
 - Tijeras Arroyo
 - Technical Area V



Remaining 9 ER Sites

6 Soil sites

~~3 “Active mission” sites with deferred corrective action~~

3 Groundwater Areas of Concern

Burn Site

Tijeras Arroyo

Technical Area V



Remaining 9 ER Sites



6 Soil sites

3 Groundwater Areas of Concern

Burn Site

Tijeras Arroyo

Technical Area V



Six Soil Sites

- Completed corrective actions at sites 8/58, 68, 149, 154 and 502
- Received Certificates of Completion from NMED in letters January 19, 2016 (8/58, 68, 149, 154) & February 29, 2016 (502)
- Requested change to Resource Conservation and Recovery Act (RCRA) Facility permit, to change status of these sites to Corrective Action Complete (letter dated May 16, 2016)
- Published legal notice of request in *Albuquerque Journal* on May 25, 2016
- Mailed notice to all persons on NMED mailing list

Six Soil Sites

- Held Public Meeting on June 21, 2016 (22 posters and 8 subject matter experts)
- 60-day public comment period, ended July 24, 2016
- NMED is reviewing our request





Remaining 9 ER Sites

6 Soil sites (five plus one)

→ 3 Groundwater Areas of Concern (AOCs)

Burn Site

Tijeras Arroyo

Technical Area V



Remaining 9 ER Sites

- 6 Soil sites (five plus one)
- 3 Groundwater Areas of Concern



Burn Site

Tijeras Arroyo

Technical Area V



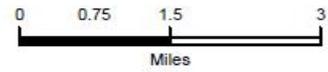
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**Burn Site
Groundwater AOC**

Legend

-  Groundwater Area of Investigation
-  SNL Technical Area
-  KAFB boundary

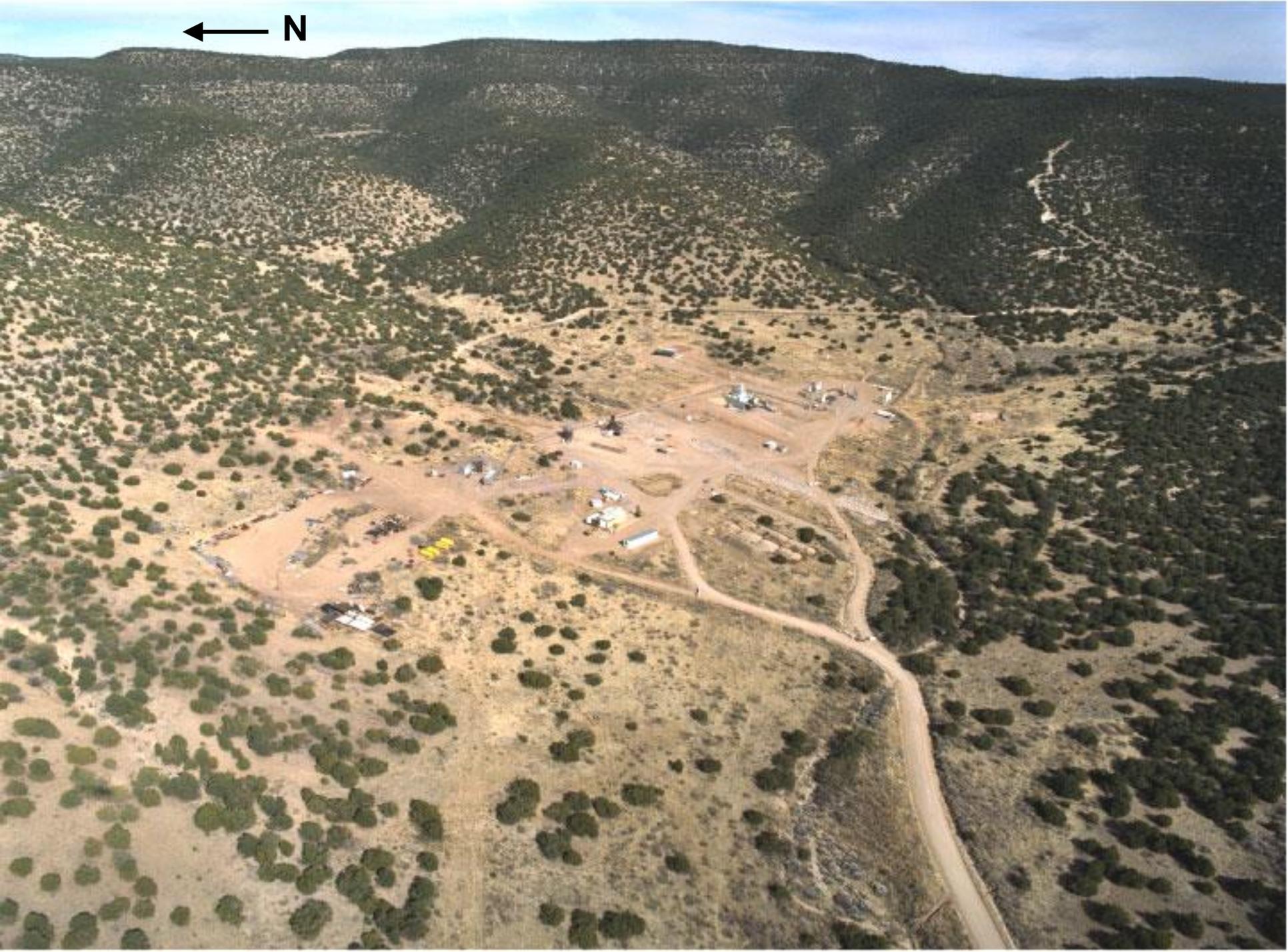


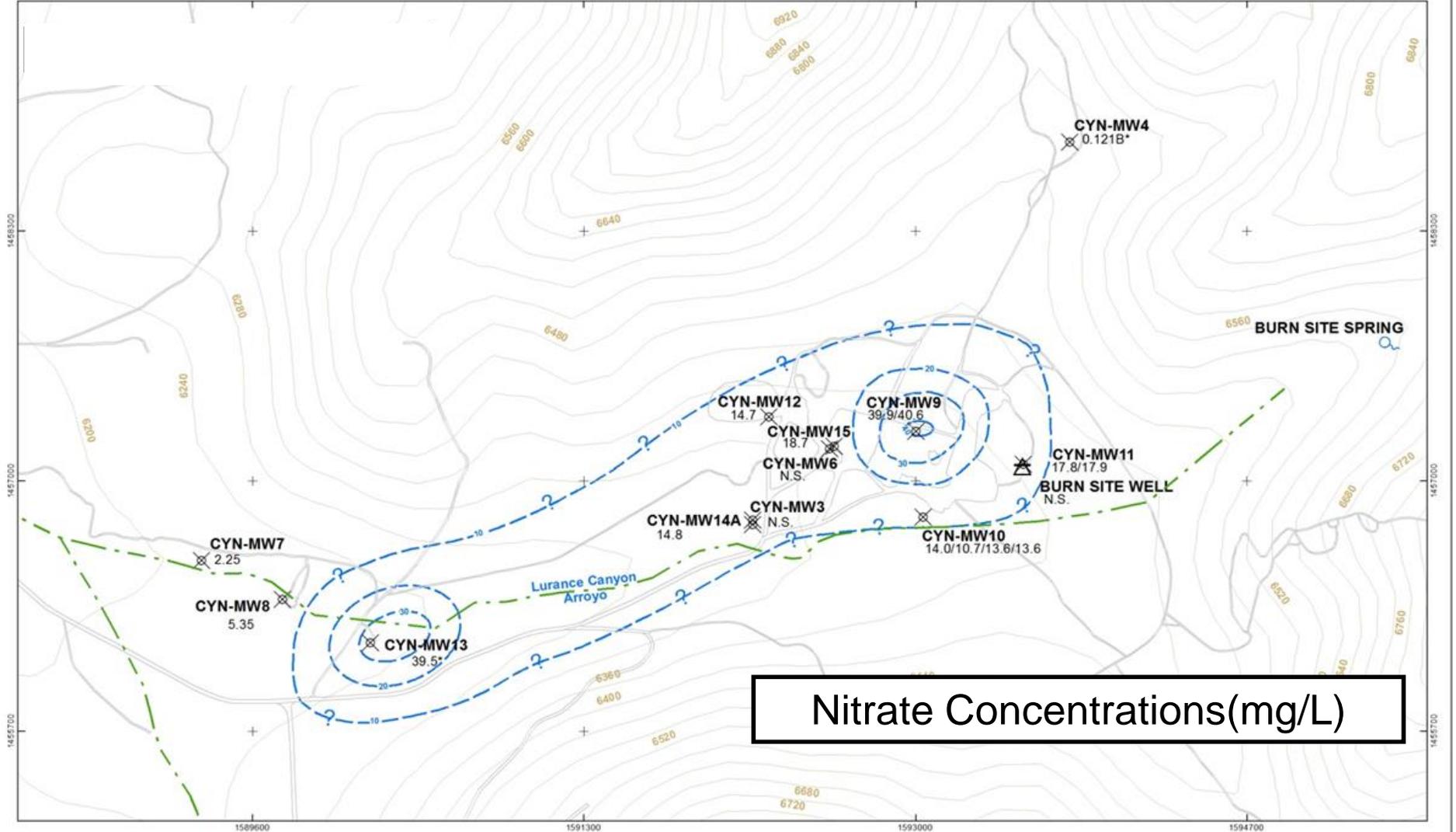


Burn Site GW AOC

- GW occurs in fractured bedrock
- Depth to GW varies from 108 to 326 ft. below surface
- GW contains nitrate, up to 42 ppm (regulatory standard is 10 ppm)
- Currently conducting weight-of-evidence process to determine origin of nitrate
- As part of weight-of-evidence process, submitted Aquifer Pumping Test Work Plan to NMED
- NMED approved Pumping Test Work Plan on June 23, 2016

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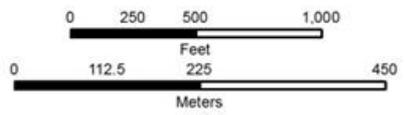




Legend

- Groundwater Monitoring Well, with December 2014, Nitrate plus Nitrite Concentrations (mg/L). N.S. denotes not sampled. *Asterik denotes June 2014 sample.
- Production Well (non-potable)
- Concentration Contour (mg/L) (dashed where inferred; queried where uncertain)
- Spring
- Unpaved Road
- Arroyo
- 40-ft. Contour

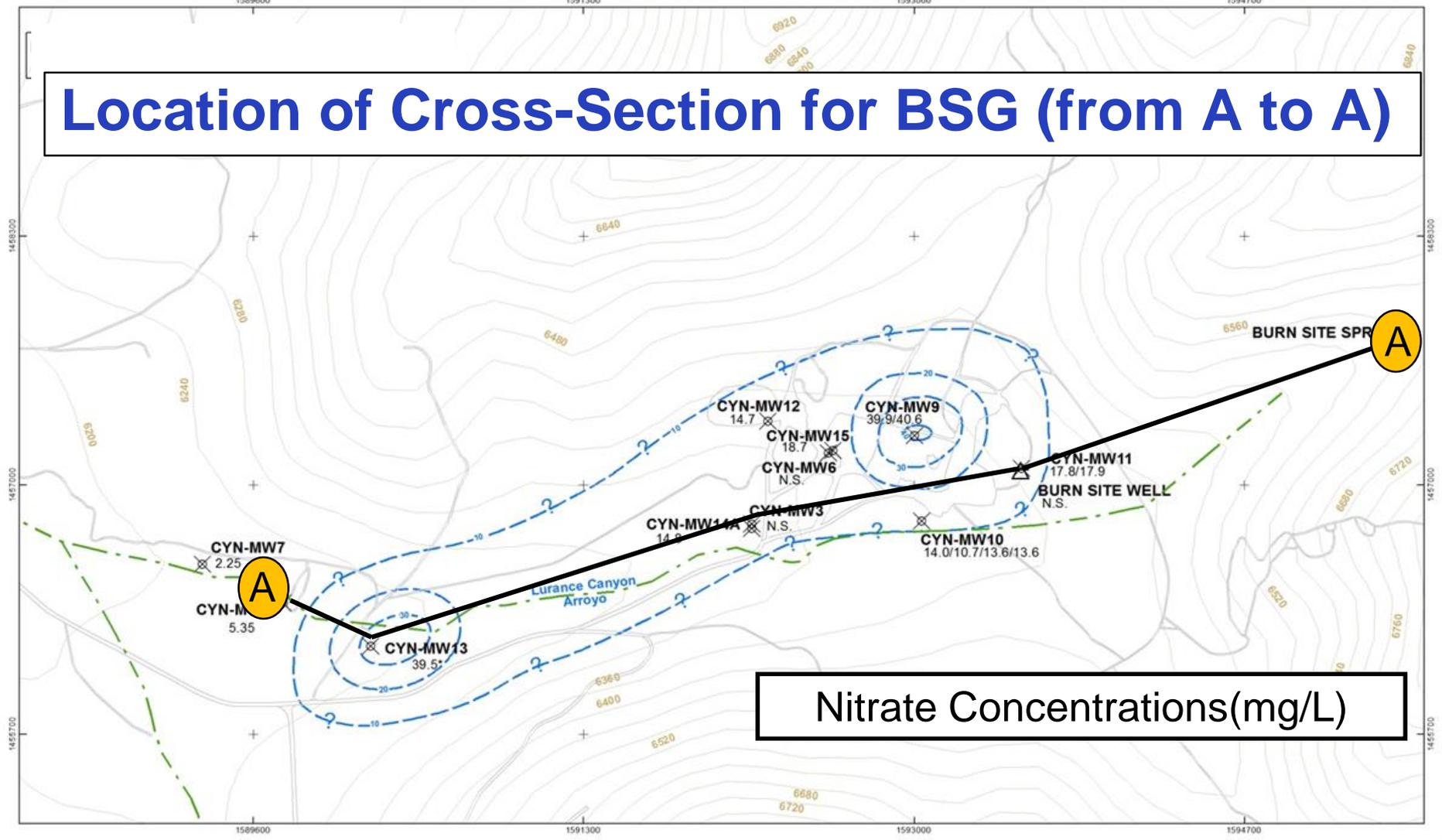
Sandia National Laboratories, New Mexico
Environmental Geographic Information System



New Mexico State Plane Central Zone, 1983
1988 North American Vertical Datum



Location of Cross-Section for BSG (from A to A)

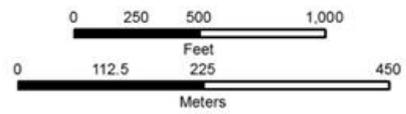


Nitrate Concentrations(mg/L)

Legend

- ⊗ Groundwater Monitoring Well, with December 2014, Nitrate plus Nitrite Concentrations (mg/L). N.S. denotes not sampled. *Asterik denotes June 2014 sample.
- △ Production Well (non-potable)
- Concentration Contour (mg/L) (dashed where inferred; queried where uncertain)
- ⊙ Spring
- Unpaved Road
- - - Arroyo
- 40-ft. Contour

Sandia National Laboratories, New Mexico
Environmental Geographic Information System



New Mexico State Plane Central Zone, 1983
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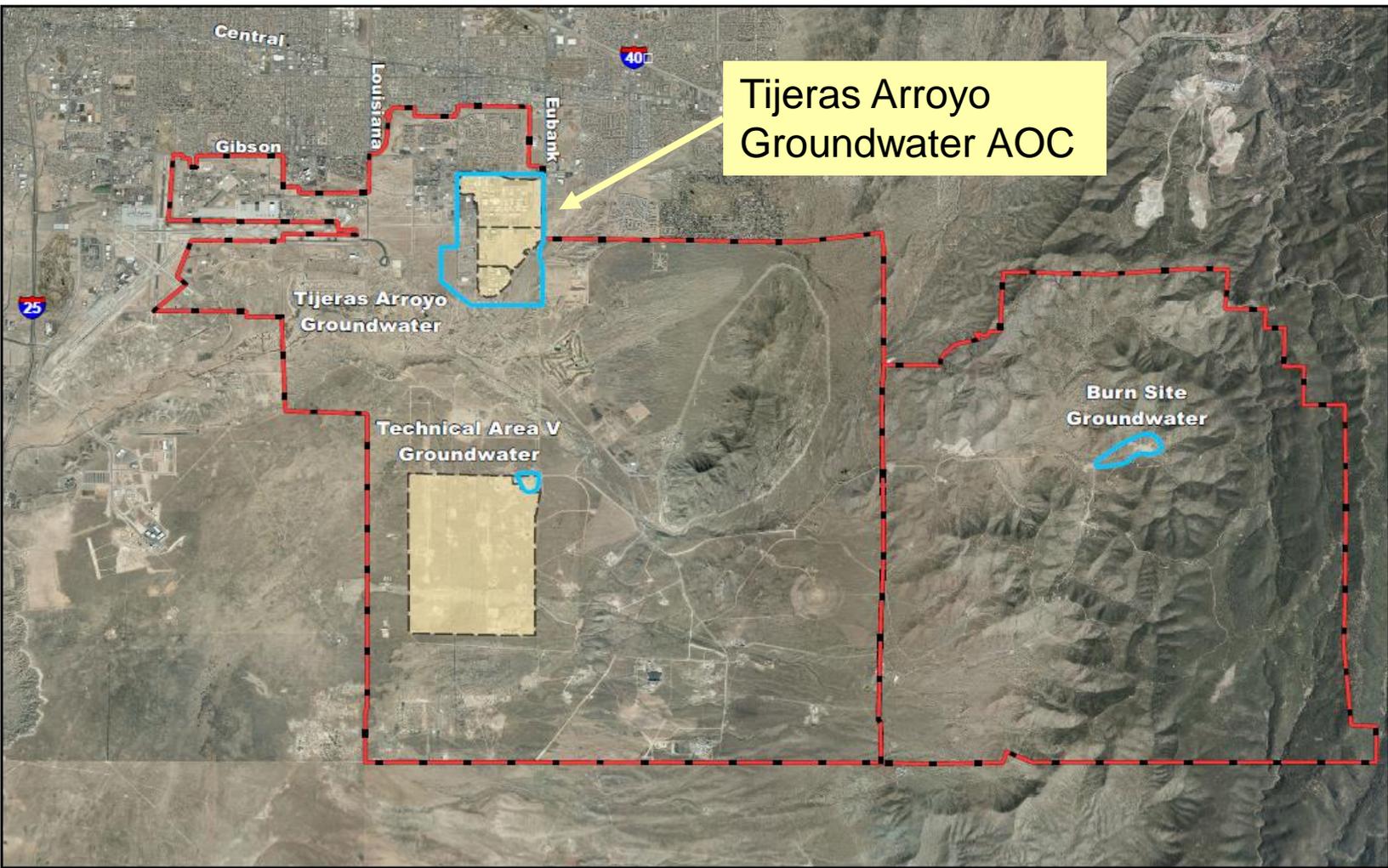


Remaining 9 ER Sites

- 6 Soil sites (five plus one)
- 3 Groundwater Areas of Concern
 - Burn Site
 - Tijeras Arroyo
 - Technical Area V



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Tijeras Arroyo
Groundwater AOC

Legend

-  Groundwater Area of Investigation
-  SNL Technical Area
-  KAFB boundary





Tijeras Arroyo Groundwater AOC

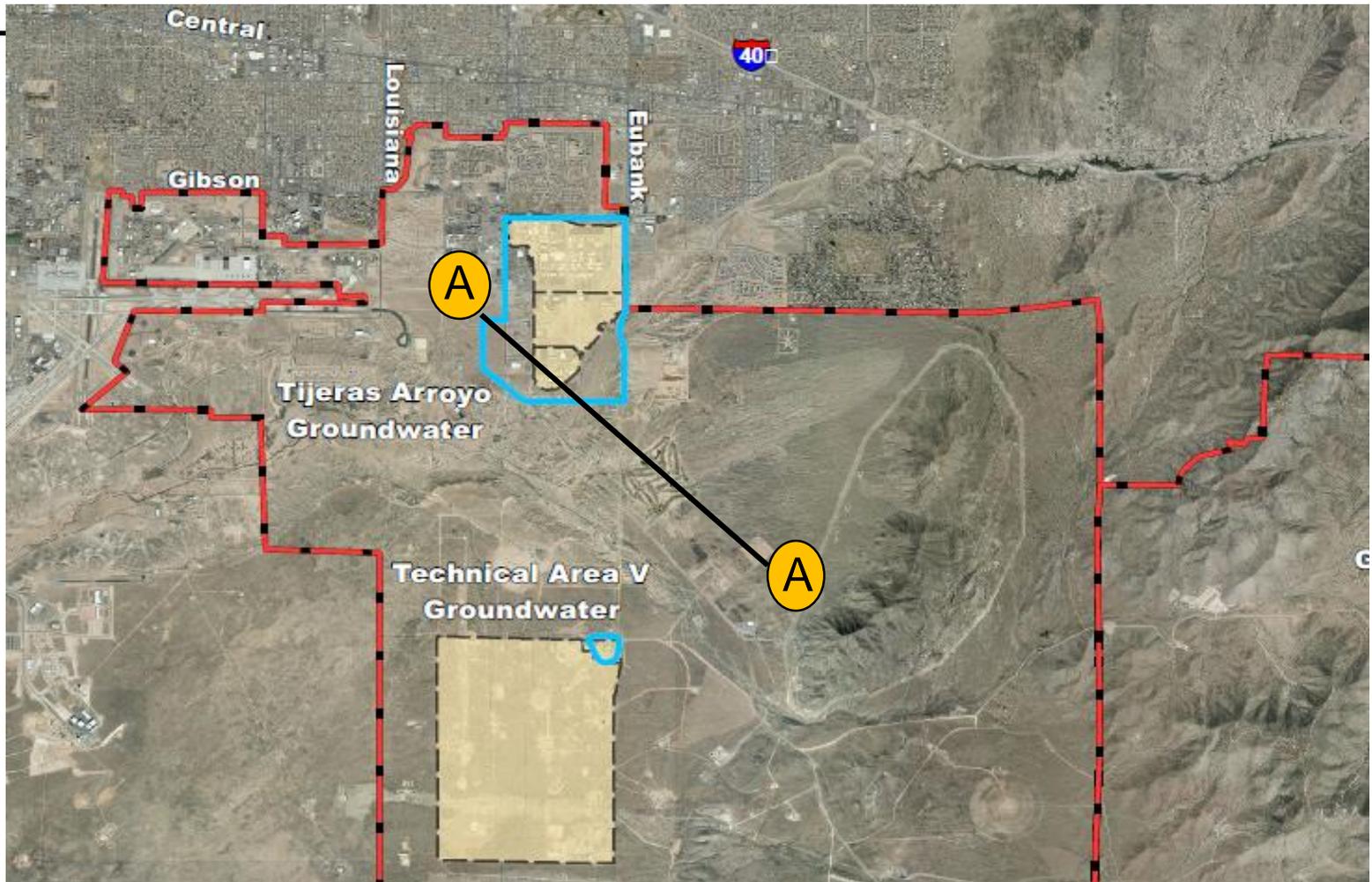
- Tijeras Arroyo Groundwater (TAG) AOC is 1.8 sq. mile
- There are currently 27 Sandia National Laboratories (SNL) monitoring wells in TAG AOC
- Based on data from SNL and KAFB monitoring wells:
 - Regional aquifer at ~500 ft in clays/silts/sands
 - “Perched” GW ~ 200 ft above regional aquifer in silts/sands



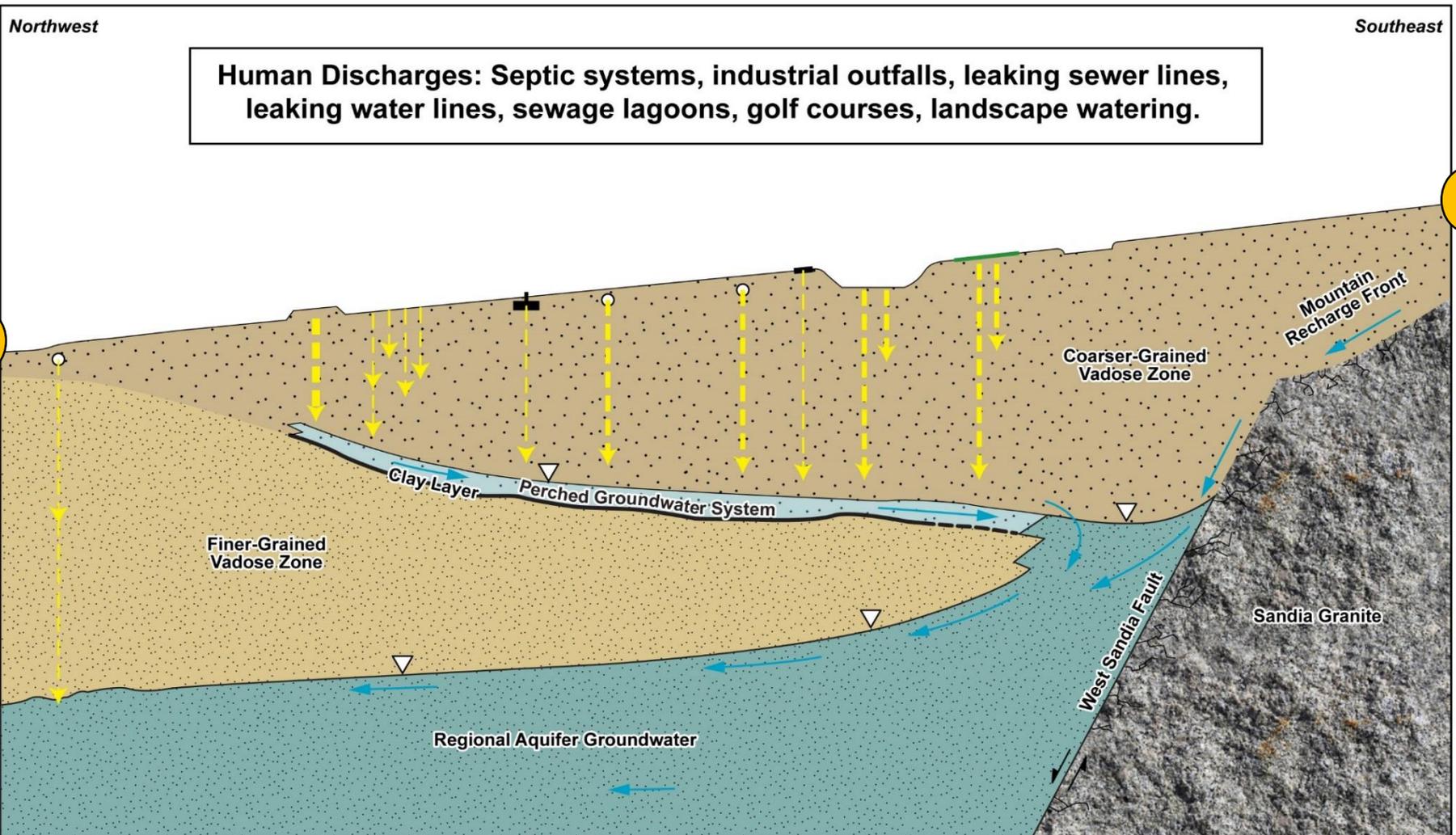
Perched Groundwater in Tijeras Arroyo Groundwater AOC

- Perched GW is from natural sources & human activities
- Examples of human activities
 - SNL's old acid waste line outfall (1948-1974)
 - SNL's TA-II Septic Systems (1948 to 1992)
 - KAFB sewage impoundments (1966 - 1987)
 - Major breaks in large City sewer line (1994, 2003 & 2013)
 - Leaks in sewer and water lines
 - Landscape watering
- Thin seam of GW 10 to 20 ft. thick in SNL's AOC
- No drinking water wells in perched GW
- Human discharges have decreased and perched GW in SNL's AOC is drying out

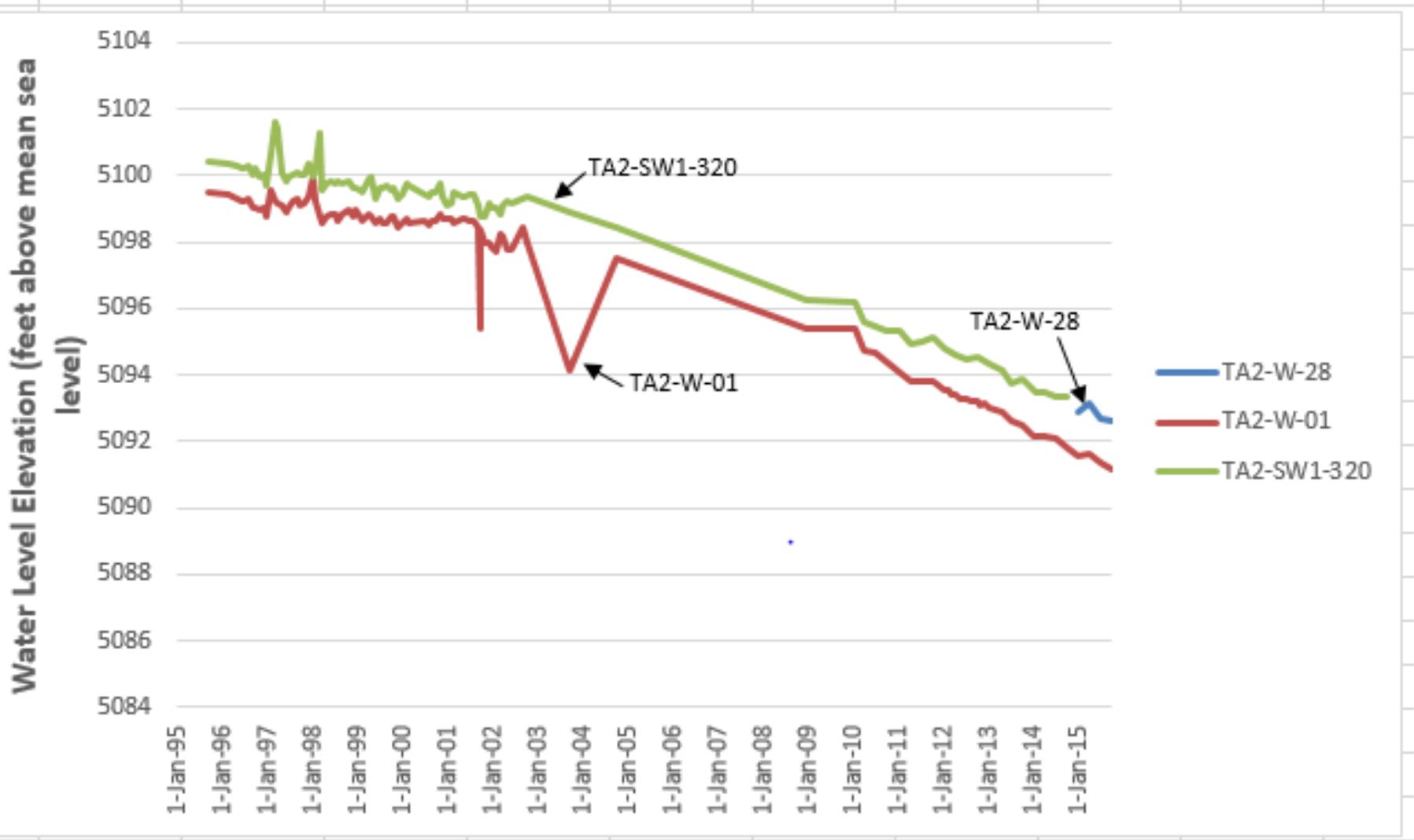
Location of Conceptual Model Cross-Section of TAG (from A to A)



Conceptual Model Cross-Section of TAG (from A to A)



20 Year Record Declining Water Levels





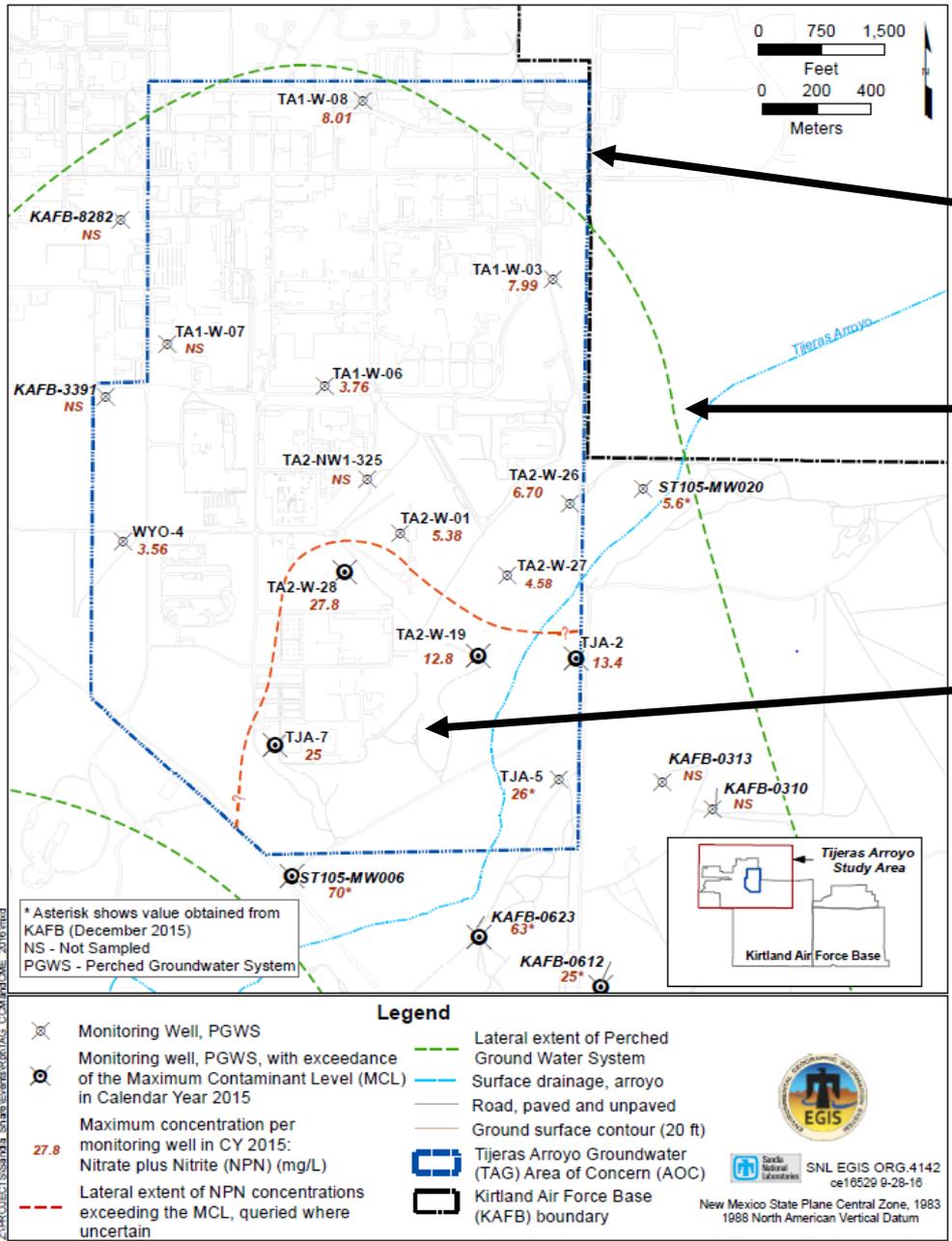
Nitrate Contamination of Tijeras Arroyo Groundwater AOC

- Within the 1.8 sq. mi. AOC, ~ 0.35 sq. mi. of perched GW is contaminated with nitrate above the drinking water standard
- Within the 1.8 sq. mi. AOC, regional GW does not contain nitrate above the drinking water standard (except extreme SE corner)
- Updated Corrective Measures Evaluation Report to NMED by December 2, 2016



Most Recent Analyses, October 2015

	Nitrate maximum, mg/L	Trichloroethylene (TCE) maximum, µg/L
Drinking Water Standard	10 mg/L	5 ug/L
Perched	27.8 mg/L	3.82 µg/L
Regional Aquifer	2.7 mg/L maximum (except the extreme SE corner)	1.67 µg/L



Area of Concern (inside blue line)

Perched Groundwater (inside green line)

Area of Nitrate Contamination (inside red line)

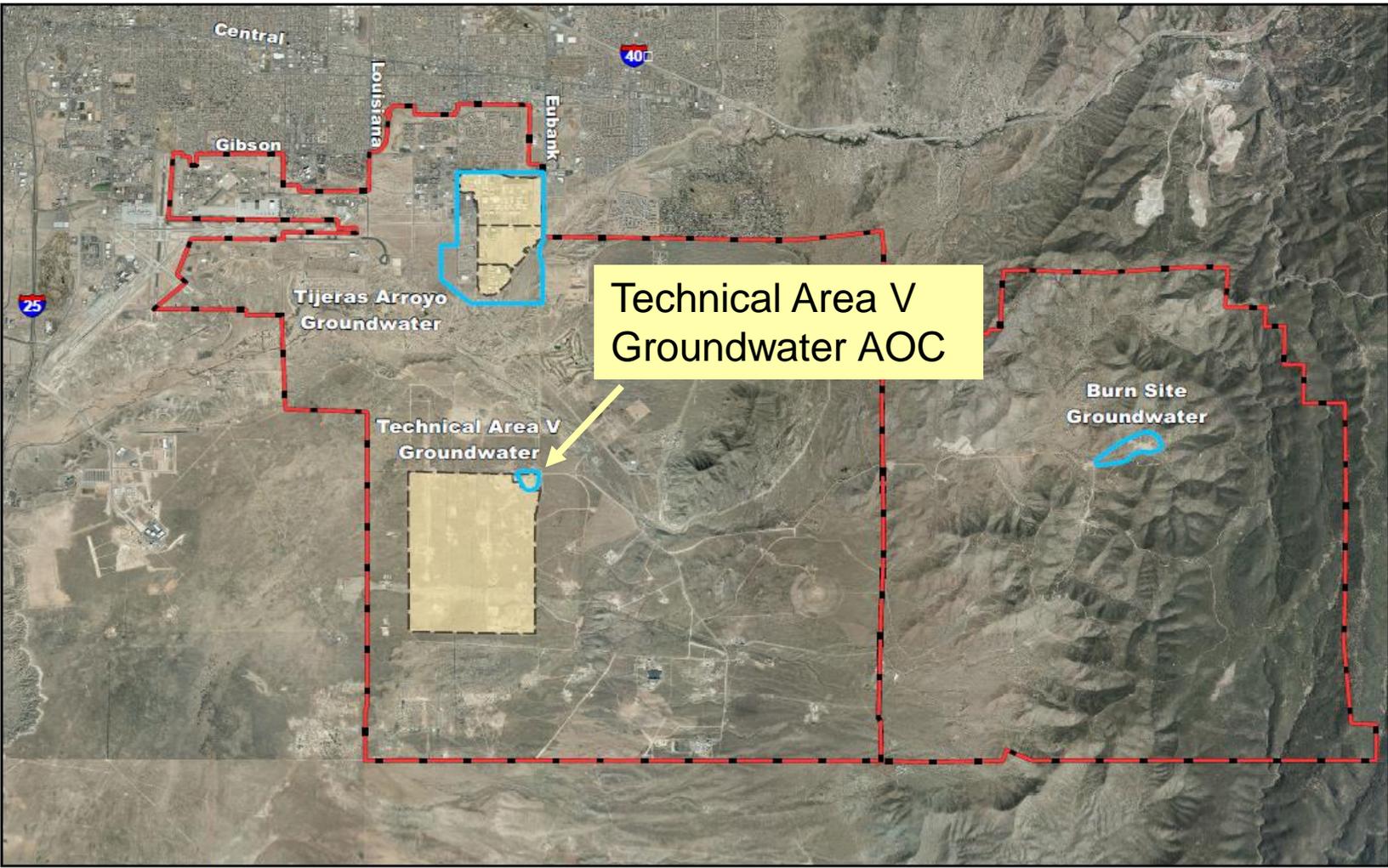


Remaining 9 ER Sites

- 6 Soil sites (five plus one)
- 3 Groundwater Areas of Concern
 - Burn Site
 - Tijeras Arroyo
 - Technical Area V



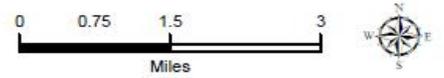
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Technical Area V
Groundwater AOC

Legend

-  Groundwater Area of Investigation
-  SNL Technical Area
-  KAFB boundary





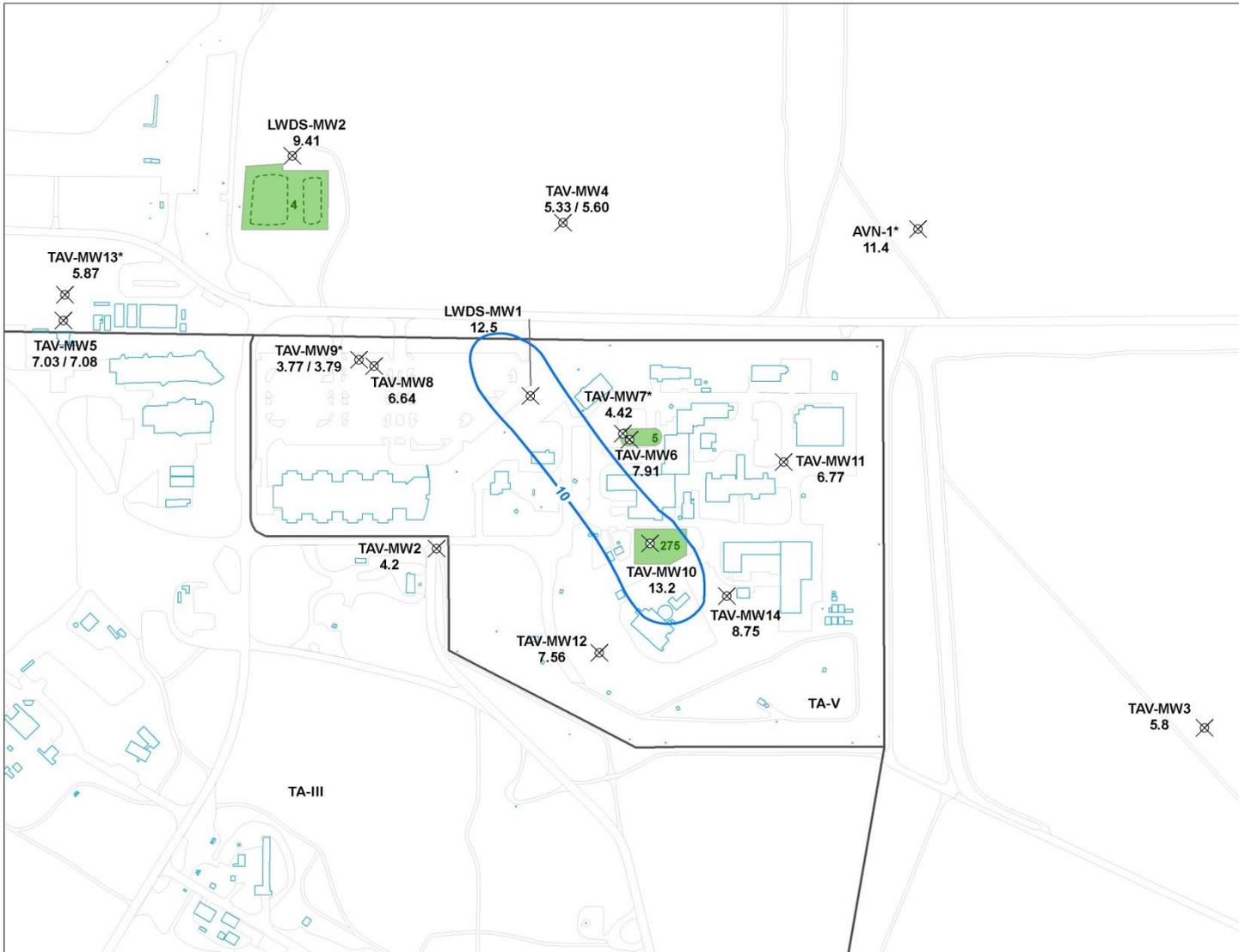


Technical Area-V GW AOC

- Technical Area V Groundwater (TAVG) AOC is 35 acres (0.05 sq. mi.)
- Current monitoring well network of 16 wells including three deep wells
- Regional GW occurs 500 ft. below surface in clays/silts/sands
- Contaminated with nitrate and trichloroethylene (TCE)
 - Nitrate: up to 14 ppm (regulatory standard is 10 ppm)
 - TCE: up to 19 ppb (regulatory standard is 5 ppb)

Nitrate Distribution in Groundwater at TA-V

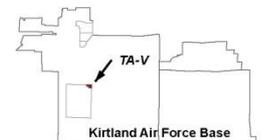
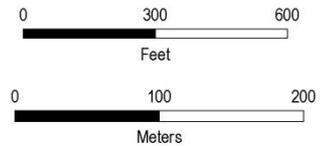
November/December 2015



Legend

- ⊗ Monitoring well, with
7.91 November/December 2015
Nitrate plus Nitrite concentrations (mg/L)
- Isoconcentration contour (mg/L)
- Road, paved and unpaved
- Building / structure
- ⋯ Inactive impoundment boundary
- Solid Waste Management Unit (SWMU)
- ▭ Technical Area (TA) boundary

Note:
* Wells AVN-1, TAV-MW7, TAV-MW9, and TAV-MW13 are completed below the water table, and were not contoured.



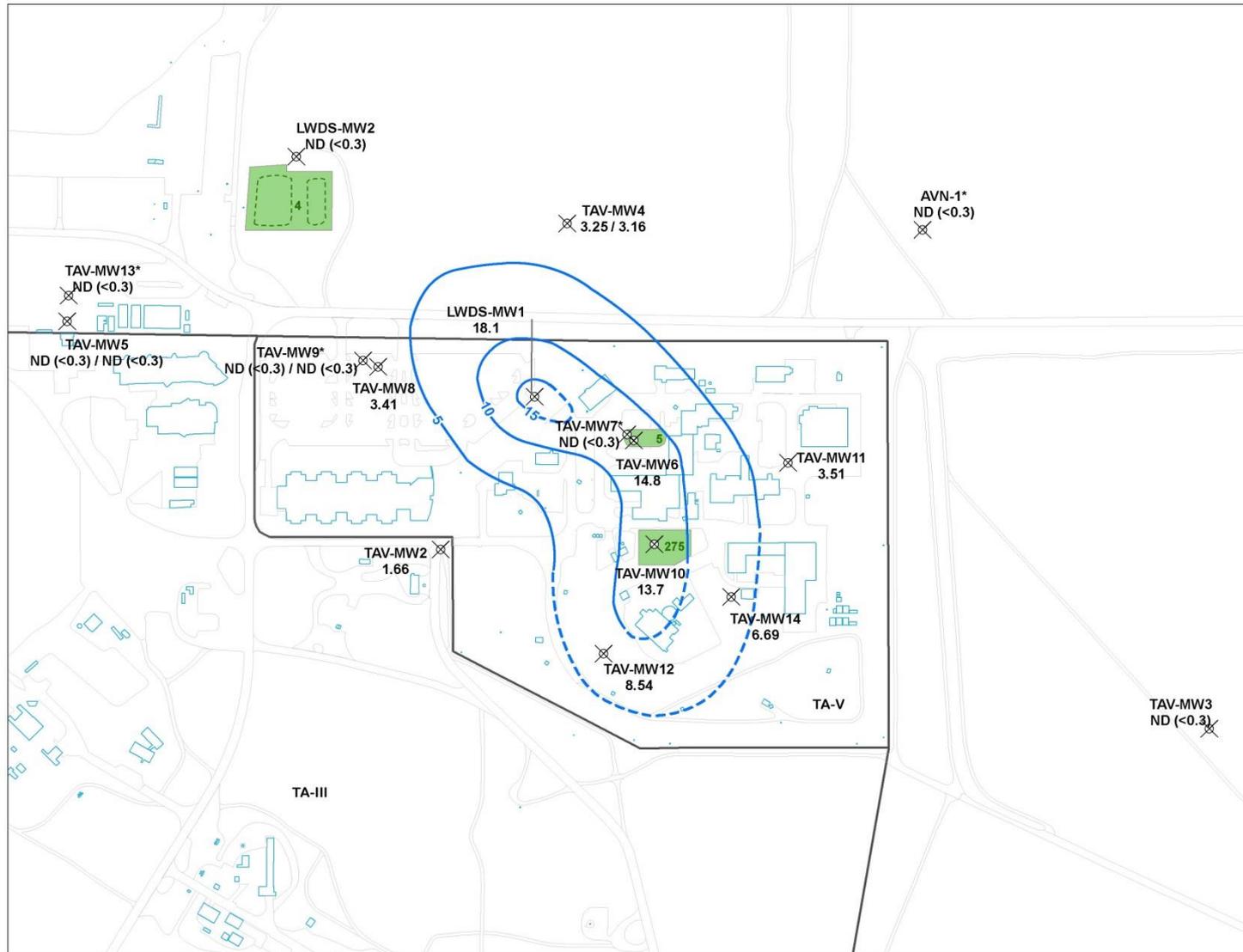
SNL EGIS ORG.4142

New Mexico State Plane Central Zone, 1983
1988 North American Vertical Datum

SNL, EGIS Dept 4142 ce16516 3-16-16 / mb13135

TCE Distribution in Groundwater at TA-V

November/December 2015



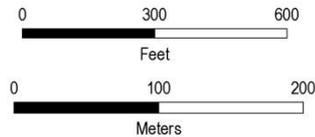
Legend

- ⊗ Monitoring well, with
3.51
November/December 2015
Trichloroethene concentrations (µg/L)
- Isoconcentration contour (µg/L),
dashed where inferred
- Road, paved and unpaved
- Building / structure
- Inactive impoundment boundary
- Solid Waste Management Unit (SWMU)
- Technical Area (TA) boundary

Notes:

* Wells AVN-1, TAV-MW7, TAV-MW9, and TAV-MW13 are completed below the water table, and were not contoured.

ND = not detected, method detection limit indicated in parentheses.



SanDiego
Laboratories
SNL EGIS ORG.4142

New Mexico State Plane Central Zone, 1983
1988 North American Vertical Datum

SNL, EGIS Dept 4142 ce16515 3-16-16 / mb13135



Path forward: a Phased Treatability Study of In-Situ Bioremediation at TA-V

- “In-Situ” means to treat the contamination in place
- “Bioremediation” means we will use biological processes to remediate the groundwater
- We will supply:
 - Dechlorinating bacteria to break down TCE
 - Nutrients for growth of bacteria
- Dechlorinating bacteria can not live outside treated area
- In-Situ Bioremediation is used at many locations in U.S., but not where GW is 500 ft deep



Phased Treatability Study

- Phase I Pilot Test
 - Injection volume is 3,700 gallons
- Phase I Full-Scale Injection at the first injection well
 - Injection volume is 530,000 gallons
 - Performance monitoring for two years
- Phase II Full-Scale Injection at the second and third injection wells
 - Same scope as Phase 1



Technical Area-V GW AOC

- Treatability Study Work Plan approved by NMED HWB May 2016
- Discharge Permit is required to inject nutrients and dechlorinating bacteria
- Discharge Permit Application submitted to NMED GWQB, July 2016
- Published public notice of the discharge permit application in the *Albuquerque Journal* on October 14th
- NMED is currently accepting statements of interest regarding the application



Summary of Progress of Sandia's ER Operations

- At 6 soil sites, completed required corrective actions and requested modification to Permit for Corrective Action Complete status
- At Burn Site GW AOC, will be conducting aquifer pumping test
- Updating Corrective Measures Evaluation Report for Tijeras Arroyo GW AOC
- At TA-V, conducting a Phased Treatability Study for in-situ bioremediation of groundwater



More Information & Questions

- On-line information ER documents hosted by NMED - <http://www.nmenv.state.nm.us/HWB/snlperm.html>
- On-line collection of ER documents hosted by UNM's Lobo Vault - <http://repository.unm.edu/handle/1928/10963>
- Annual Groundwater Monitoring Report for Sandia Labs - http://www.sandia.gov/news/publications/environmental_reports/index.html
- Send email questions to - envinfo@sandia.gov



Backup Slides

“AOC means any area that may have had a release of a hazardous waste or hazardous constituent, which is not a Solid Waste Management Unit”

“Solid Waste Management Unit” or “SWMU” means **any discernible unit at which solid waste has been placed** at any time, **and from which** the Department determines **there may be a risk of a release of hazardous waste or hazardous constituents**, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at the Facility at which solid wastes **have been routinely and systematically released; they do not include one-time spills**. See 61 Fed. Reg. 19431, 19442-43 (May 1, 1996).



Additive	Purpose
Ethyl lactate	Removes oxygen from water (electron donor)
KB-1 [®] Primer	Accelerates deoxygenation of water
KB-1 [®] Dechlorinator (<i>Dehalococcoides mccartyi</i>)	Mixture containing bacteria that breakdown trichloroethylene
Diammonium phosphate	Nutrient and pH buffer
Yeast extract	Nutrient
Sodium bromide	Inert tracer



Information Available to Public

- **NMED HWB Website, <https://www.env.nm.gov/HWB/> → “Waste Facilities”, then → “Sandia National Laboratories (SNL)”:**
 - **Consolidated Quarterly Report (most recent is April 2016)**
 - **CY 2015 Annual Groundwater Monitoring Report**
 - **NMED DOE Oversight Bureau data on groundwater sites at SNL**
- **Physical copies of the Quarterly Reports and the Treatability Study Work Plan are available at UNM Zimmerman library.**



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Our Mission

The Hazardous Waste Bureau's (HWB's) mission is to provide regulatory oversight and technical guidance to New Mexico hazardous waste generators and treatment, storage, and disposal facilities as required by the New Mexico Hazardous Waste Act [HWA; Chapter 74, Article 4 NMSA 1978] and regulations promulgated under the Act. New Mexicans will then be assured that hazardous waste is managed, and contaminated sites are cleaned up, in a manner that is safe and protective of human health and the environment. HWB also ensures abandoned hazardous substances are handled on an emergency basis, and lessens the resulting hazards that may present endangerment to humans.

Kirtland Air Force Base - Bulk Fuels Facility Spill

Correspondence and documents regarding the Bulk Fuels Facility Spill can be found by [clicking on this link](#).

Notifiers

The Annual Hazardous Waste Fee Report is now available for download. Please visit the [Hazardous Waste Bureau Notifiers Page](#).



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Hazardous Waste Facilities

This Web Page provides links to public notices and information on New Mexico hazardous waste treatment, storage, or disposal facilities.

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[Kirtland Air Force Base \(KAFB\)](#)

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[White Sands Missile Range \(WSMR\)](#)

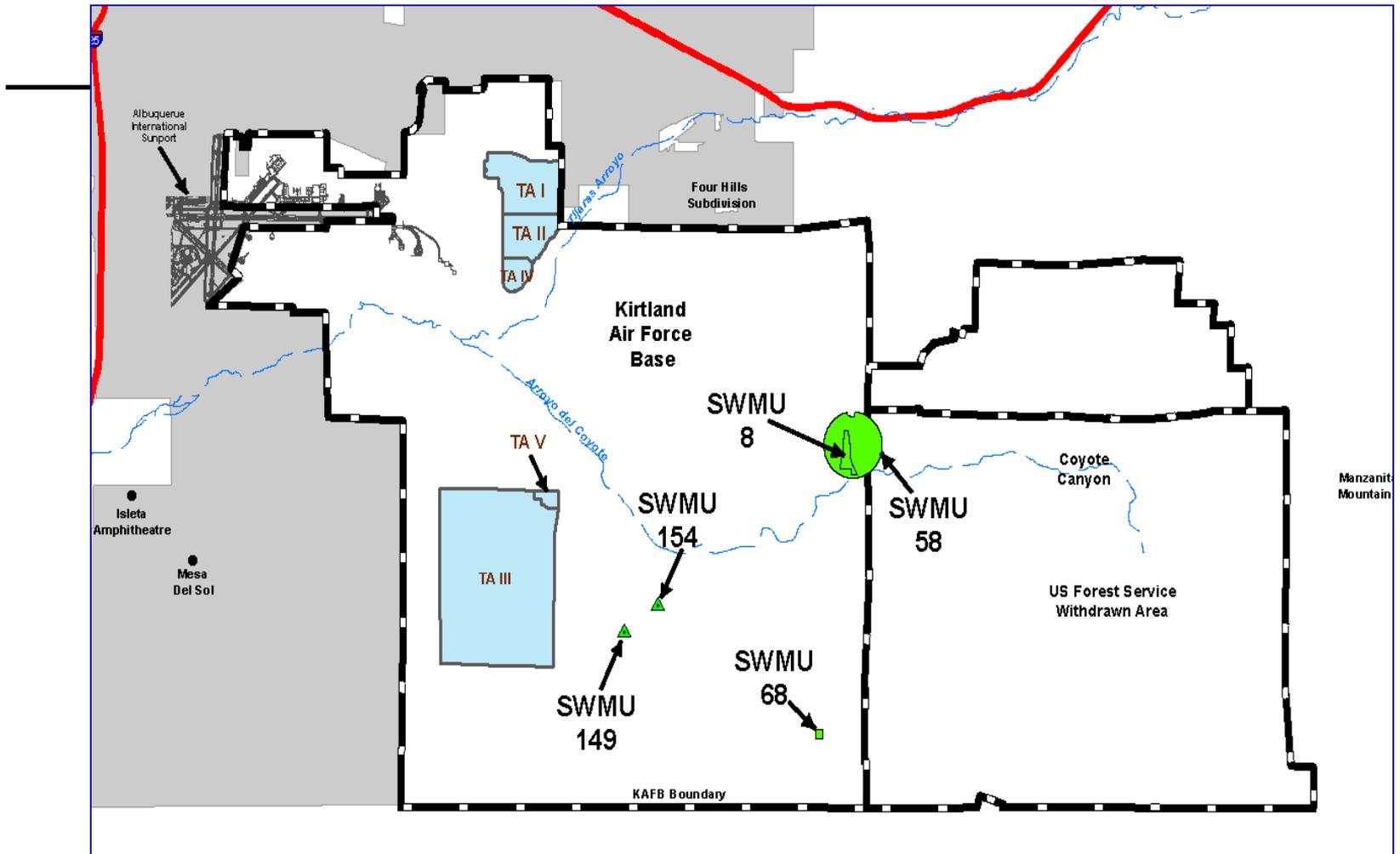
Department of Energy Facilities

[Los Alamos National Laboratory \(LANL\)](#)

[Sandia National Laboratories \(SNL\)](#)



-
- 8 Open Dump (Coyote Canyon Blast Area)**
 - 58 Coyote Canyon Blast Area**
 - 68 Old Burn Site**
 - 149 Bldg. 9930 Septic System (Coyote Test Field)**
 - 154 Bldg. 9960 Septic System and Seepage Pits (Coyote Test Field)**
 - 502 Building 9938 Surface Discharge Site**



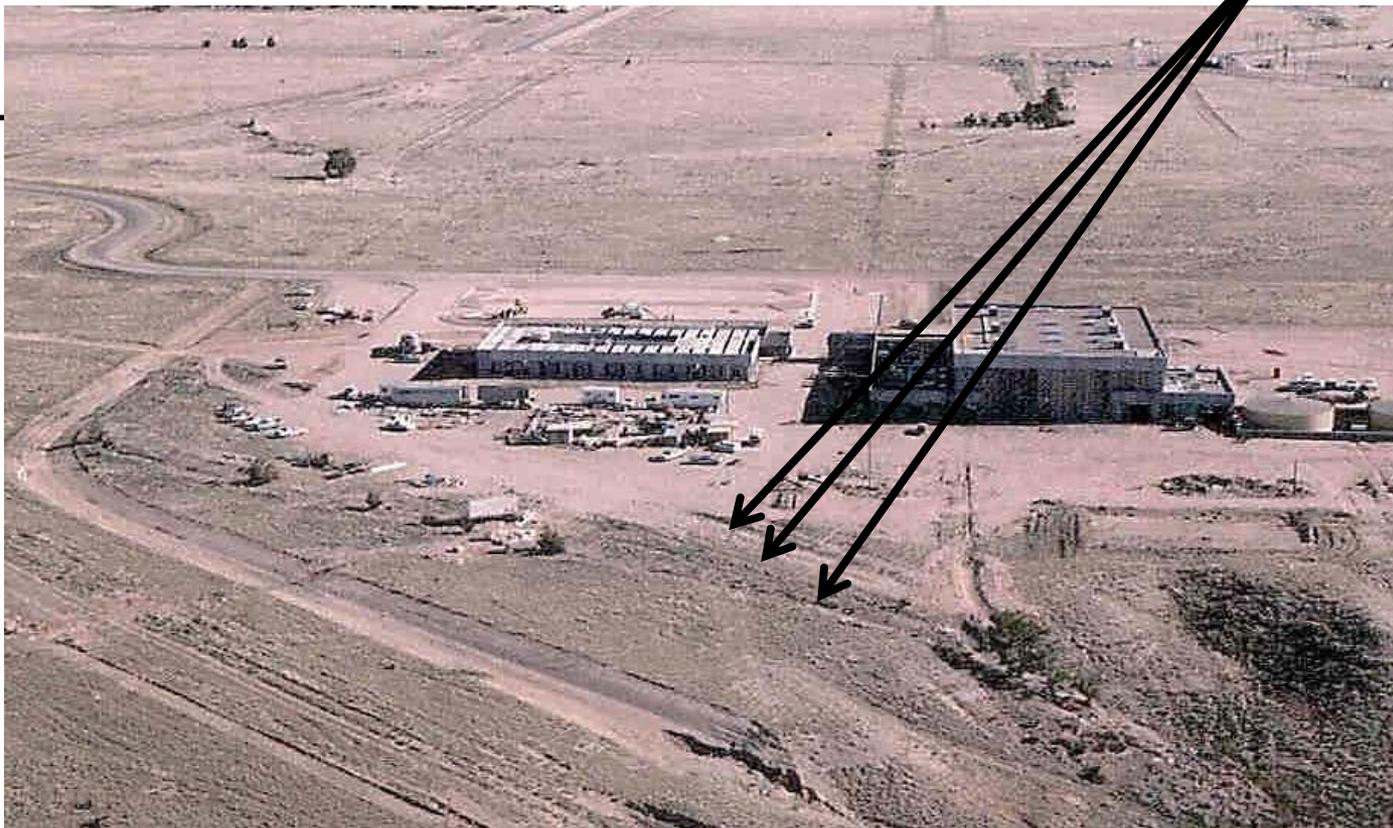


SWMU 46

Old Acid Waste Line Outfall

- The Old Acid Waste Line connected to research laboratories, machine shops, a paint shop, an electroplating shop, a foundry, and a photographic processing laboratory
- SWMU 46 consists of 3 unlined outfall ditches:
 - Received effluent from the Old Acid Waste Line & drained to rim of Tijeras Arroyo
 - First outfall ditch was constructed approximately 1948
 - Second, and parallel ditch was constructed about 1950
 - Third ditch was constructed in the mid-1960s
- Late 1960s, estimated discharge was 130,000 gallons per day
- Discharges stopped and ditches filled about 1974

Three SWMU 46 outfall ditches faintly visible



**Photograph showing TA-IV and Building 980 in 1978.
Current storm water ditch is at lower left corner.**



Corrective Action is Complete

- Significant soil sampling program (327 samples) with analysis for metals, VOCs, SVOCs, PCBs, HE compounds, and radionuclides beginning in 2001
- Voluntary Corrective Measure to remove PCB-contaminated soils in 2003
- February 26, 2015 granted status of Corrective Action Complete with Controls